Lesson Plan

Dr. Sanjay Kumar

Class: BSc 1st Year 2nd Sem

Subject: Properties of Matter and Kinetic Theory of Gases.

Week	Topics
1	Rotation of rigid body, Moment of inertial, Torque, angular momentum, Kinetic Energy of rotation.
2	Theorem of perpendicular and parallel axes (with proof), Moment of inertia of solid sphere, hollow sphere.
3	Moment of inertia of spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross–section.
4	Fly wheel, Moment of inertia of an irregular body, Acceleration of a body rolling down on an inclined plane.
5	Elasticity, Stress and Strain, Hook's law, Elastic constant and their relations, Poisson's ratio, Torsion of cylinder and twisting couple,**ASSIGNMENT**
6	Determination of coefficient of modulus of rigidity for the material of wire by Maxwell's needle.
7	Bending of beam (Bending moment and its magnitude), Cantilever and Centrally loaded beam.
8	Determination of Young's modulus for the material of the beam and Elastic constants for the material of the wire by Searle's method.
9	**SESSIONAL TEST** Assumption of Kinetic theory of gases, pressure of an ideal gas (with derivation).
10	Kinetic interpretation of Temperature, Ideal Gas equation.
11	Degree of freedom, Law of equipartition of energy and its application for specific heat of gases,
12	Real gases, Vander wall's equation, Brownian motion(Qualitative)
13	Maxwell's distribution of speed and velocities (derivation required)
14	Experimental verification of Maxwell's law of speed distribution: most probable speed, average and r.m.s. speed, Mean free path,
15	Transport of energy and momentum, Diffusion of gases. **REVISION**

Lesson Plan

Dr. Sanjay Kumar

Class: BSc 1st Year 2nd Sem

Subject: Semiconductor Devices

Week	Topics
1	Energy bands in solids, Intrinsic and extrinsic semiconductors, carrier mobility and electrical resistivity of semiconductors, Hall effect,
2	p-n junction diode and their characteristics, Zener and Avalanche breakdown, Zener diode, Zener diode as a voltage regulator. Light emitting diodes (LED),
3	Photoconduction in semiconductors, Photodiode, Solar Cell, p-n junction as a rectifier, half wave and full wave rectifiers (with derivation),
4	Filters (series inductor, shunt capacitance, L-section or choke, π and R.C. filter circuits).
5	Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (C-B, C-E, C-C modes),**ASSIGNMENT**
6	Common base, common emitter and common collector characteristics of transistor,
7	Constants of a transistor and their relation, Advantages and disadvantages of C-E configuration.
8	D.C. load line .Transistor biasing; various methods of transistor biasing and stabilization.
9	**SESSIONAL TEST** Amplifiers, Classification of amplifiers, common base and common emitter amplifiers
10	Coupling of amplifiers, various methods of coupling,
11	Resistance- Capacitance (RC) coupled amplifier (two stage, concept of band width, no derivation),
12	Feedback in amplifiers, advantages of negative feedback, emitter follower, distortion in amplifiers.
13	Oscillators, Principle of oscillation, classification of oscillators,
14	Condition for self sustained oscillation: Barkhausen criterion for oscillation,
15	Tuned collector common emitter oscillator, Hartley oscillator, C.R.O. (Principle and Working).**REVISION**

March → April → May → June → July →

Sanjay

Bharadwaj.

Lesson Plan

Dr. Sanjay Kumar

Class-B.Sc 2nd (4th Sem) Subject-Wave and Optics-II

Week	Topics
1	polarization and double refraction, polarisation by reflection, polarisation by scattering, malus law, phenomenon of double refraction
2	Huygen's wave theory of double refraction, analysis of polarised light, Nicol prism, quarter wave plate and half wave plate
3	production and detection of plane polarised light, circularly polarized light and elliptically polarized light
4	optical activity, fresnel theory of rotation, specific rotation, polarimeters, numericals problems
5	Fourier Series, fourier coefficients, odd functions
6	even function, fourier theorem
7	analysis of complex waves and its application for the solution of triangle and rectangular waves
8	half and full wave rectifier outputs,unit Test, numerical problems.
9	fourier transform and its properties
10	Matrix method in paraxial optics, effect of translation and refraction
11	derivation of thin lens and thick lens formula
12	Unit plane nodal planes, system of thin lenses, chromatic, spherical, coma, astigmatism and distortion
13	aberrations, Optical Fibre, critical angle of propagation, mode of propagation, Assignment, Numerical problems.
14	acceptance angle, fractional refractive index change, numerical aperture
15	types of optical fibre, normalised frequency, fibre optic communication, advantages, numerical problems.

Lesson Plan

Dr. Sanjay Kumar

Class: B.Sc 2nd **Semester: 4th**

Subject- Statistical physics

Week	Topics
1	Microscopic and Macroscopic systems, events-mutually exclusive, dependent and independent, Probability, statistical probability, A priori probability and relation between them, probability theorem, some probability considerations
2	Combinations possessing maximum probability, combination possessing minimum probability, Tossing of 2,3 and any number of coins, Permutations and combinations.
3	Distribution of N (for N=2,3,4) distinguishable and indistinguishable particles in two boxes of equal size,micro and Macro states, Thermodynamical probability, Constraints and Accessible states
4	Statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, Condition of equilibrium between two systems in thermal contact- β parameter, Entropy and Probability (Boltzman's relation)
5	Postulates of statistical physics, phase space, Division of phase space into cells, three kind of statistics, basic approach in three statistics. **Class test**
6	M.B. statistics applied to an ideal gas in equilibrium- energy distribution law (including evaluation of α and β), speed distribution law and velocity distribution law.
7	Expression for average speed r.m.s. speed, average velocity. **Assignment**
8	r.m.s. velocity, most probable energy & mean energy for Maxwellian distribution.
9	Need for quantum statistics: Bose-Einstein energy distribution law, Application of B.E. statistics to Planck's radiation law B.E.gas, Degeneracy and B.E. Condensation.
10	Fermi-Dirac energy distribution law, F.D. gas and degeneracy, Fermi energy and Fermi temperature, Fermi-Dirac energy distribution law, Fermi Dirac gas and degeneracy
11	Fermi energy and Fermi temperature; Fermi-Dirac energy distribution law for electron gas in metals, zero point energy, zero point pressure and average speed (at 0 K)of electron gas
12	Specific heat anomaly of metals and its solution. M.B. distribution as a limiting case of B.E. and F.D. distributions, comparison of three statistics
13	Dulong and Petit law. Derivation of Dulong and Petit law from classical physics. Specific heat at low temperature.
14	Einstein theory of specific heat, Criticism of Einstein theory, Debye model of specific heat of solids.
15	Success and shortcomings of Debye theory, comparison of Einstein and Debye theories.

March — April — May — June — July

LESSON PLAN
B.Sc. -3rd 5th semester
Paper:- Solid State Physics

Week	Topics
1	Crystalline and Glassy forms, liquid crystals. crystal structure, periodicity, lattice and basis crystal translational vectors and axes. unit cell and primitive cell, Winger Seith primitive cell symmetry operation for a two dimensional crystal
2	Bravais lattice in two and three dimensions. Crystal plane and Miller Indices Interplanar spacing
3	crystal structure of sodium chloride and diamond and Zine sulphide. Problem discussion of unit -1
4	X-ray diffraction Bragg's law and experimental x-ray diffraction method k-space reciprocal lattice and its physical significance of reciprocal lattice vectors. reciprocal lattice to a simple cubi,c BCC,FCC
5	reciprocal lattice and its physical significance of reciprocal lattice vectors reciprocal lattice to a simple cubic
6	reciprocal lattice to a lattice BCC reciprocal lattice to a FCC
7	Problem Discussion of unit-1 & unit-2, unit test, Assignment Submission
8	Unit III superconductivity Historical introduction, Survey of superconductivity. superconducting system. high temperature superconductors, isotopic effect critical magnetic field
9	Meissner effect, London's theory and peppard equation classification of superconductors (Type 1 and Type II
10	BCS theory of superconductivity ,flux quantization, josephson effect(AC and DC) practical application of superconductivity and their limitations power applications of superconductors
11	Practical application of superconductivity and their limitations. power applications of superconductors, Numerical discussion ,class test of unit-3
12	Definition, length scale, importants of nano scale and Technology. history of Nano Technology. benefits and challenges in molecular manufacturing. molecular assembler concept
13	understanding advanced capability. Vision and objectives of Nanotechnology Nanotechnology in different field like automobile
14	Nanotechnology in electronics, Nanotechnology in Nano-biotechnology ,nanotechnology in material, Nano- technology in medicine
15	Problem discusion of unit-4,class test of unit-4

Lesson Plan
B.Sc. -3rd 5th semester
Paper:- Atomic and Molecular Physics

Week	Topics
1	Unit first historical background of atomic spectroscopy.Introduction of early observations, emission and absorption spectra, atomic spectra,wave number, spectrum of hydrogen atom in Balmer series,Bohr atomic model.Bohr postulates spectra of hydrogen atom of explanation of spectral series in hydrogen atom and un- quantized states and continuous spectra, correction of finite nuclear mass variation in constant
2	shortcomings of Bohr theory, Wilson sommerfield quantization rule, Di Broglie interpretation of Bohr quantization Law, Bohr corresponding principal.
3	vector atom model, space quantization, electron spin coupling of Orbital and spin angular momentum, spectroscopic terms and their notation, Quantum numbers associated with vector atom model, transition Probability and selection rule
4	Orbital magnetic dipole moment, Bohr magnetic, Behaviour of magnetic dipole in external magnetic field ,Larmor precession and theorem. penetrating and non penetrating orbits.
5	penetrating orbits on the classical model Quantum defect spin Orbit interaction energy of the single valence electron spin interaction of penetrating and non penetrating orbits quantum mechanical relativity correction. Hydrogen fine spectra ,main features of alkali spectra and their theoretical interpretation term series and limits
6	absorption spectra of alkali atoms observed doublet fine structure in the spectra of alkali metals and its interpretation. intensity is rule for doublets, comparison of alkali spectra and hydrogen spectrum
7	Problem Discussion of unit-1 & unit-2, unit test, Assignment
8	Essential feature of spectra of alkaline earth elements vector model for two valence electron atom: application of spectra, LS coupling& J-J coupling
9	interaction energy in LS coupling (sp. pd) configuration land interval rule, Pauli principle and periodic classification of the element interaction energy. interaction energy in JJ coupling as (sp.pd) configuration.
10	equivalent and non-equivalent electrons . comparison of spectral terms in LS and JJ coupling. hyperfine structure of spectral lines and its origin isotope effect ,nuclear spin
11	Zeeman effect(normal and Anomalous) experimental setup for studying zeeman effect. explanation of normal Zeeman effect
12	Classical and Quantum mechanical explanation of Anomalous Zeeman effect. lande factor and pattern of D1 and D2 lines of Na atom. Paschen -back effect of a single Valence Electrons system, weak field stark effect of hydrogen atom
13	General considerations, electronic states of diatomic molecules, rotational spectra (far IR and microwave region)
14	Numerical discussion , problem discussion of all three units

March
April
May
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July